

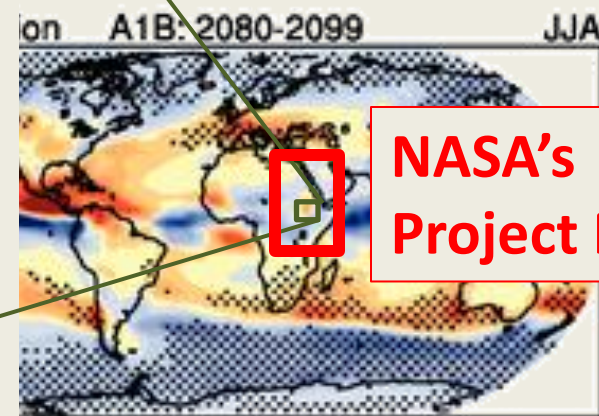
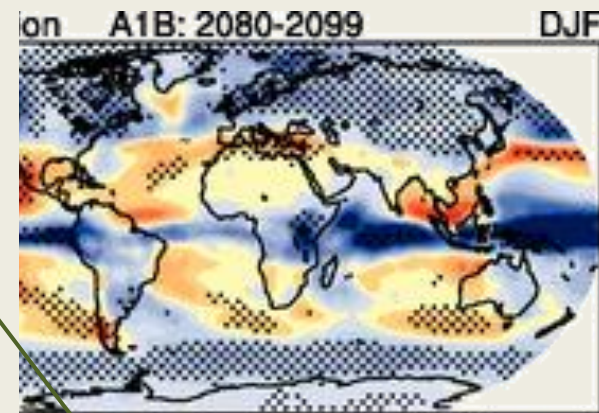
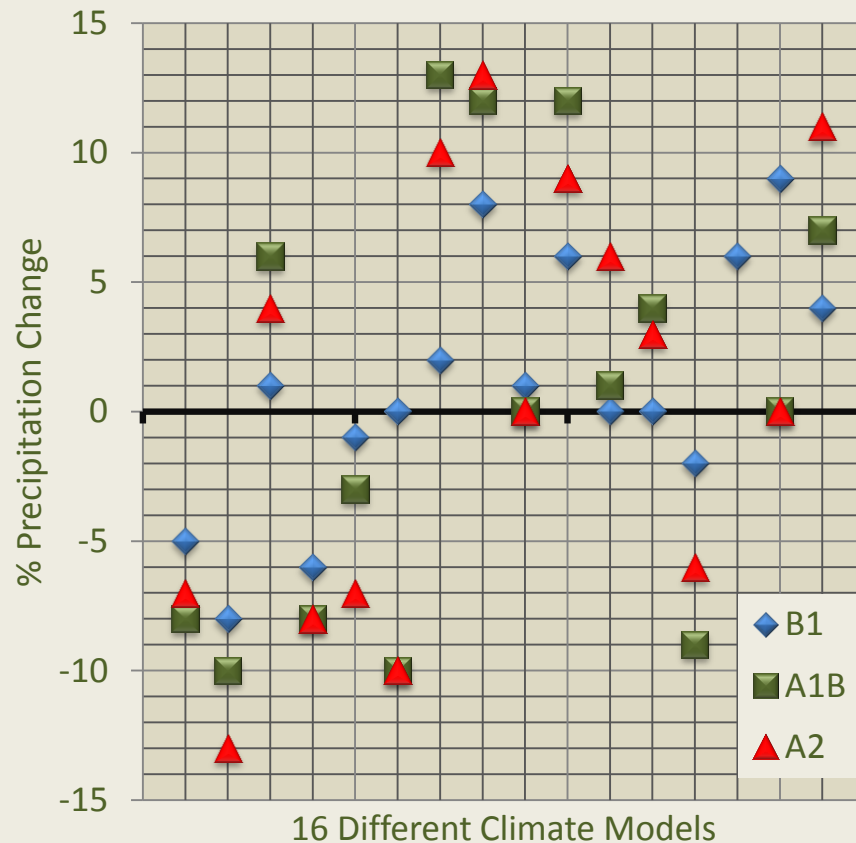
Climate Analysis for Enhanced Resilience

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Projected Precipitation Changes

Change in Annual Precipitation:
2080s – present, Blue Nile Headwaters



**NASA's
Project Nile**

GCM-based Precipitation Maps

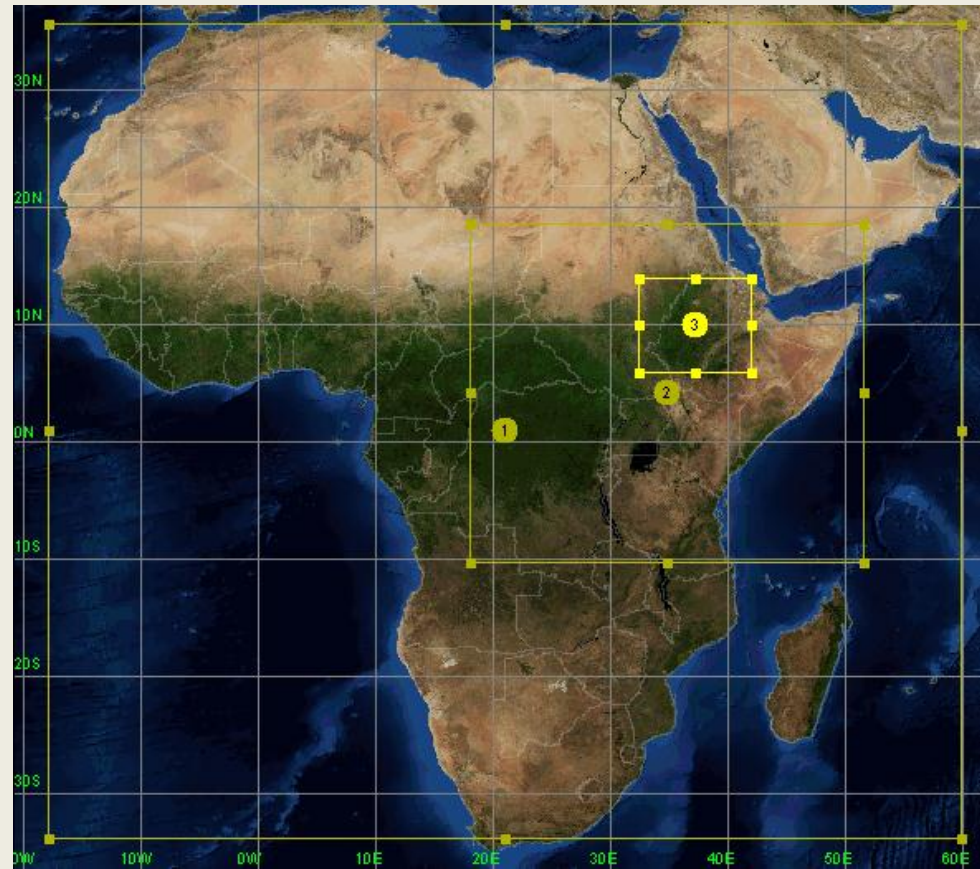
- Spatially coarse
- Highly uncertain
- Underestimate extremes
- Systematically wrong in some regions

So: Are the GCMs Useless?

- **No:** there is useful information in the projections
- **But:** precipitation projections applied directly to food/water security planning can be worse than useless

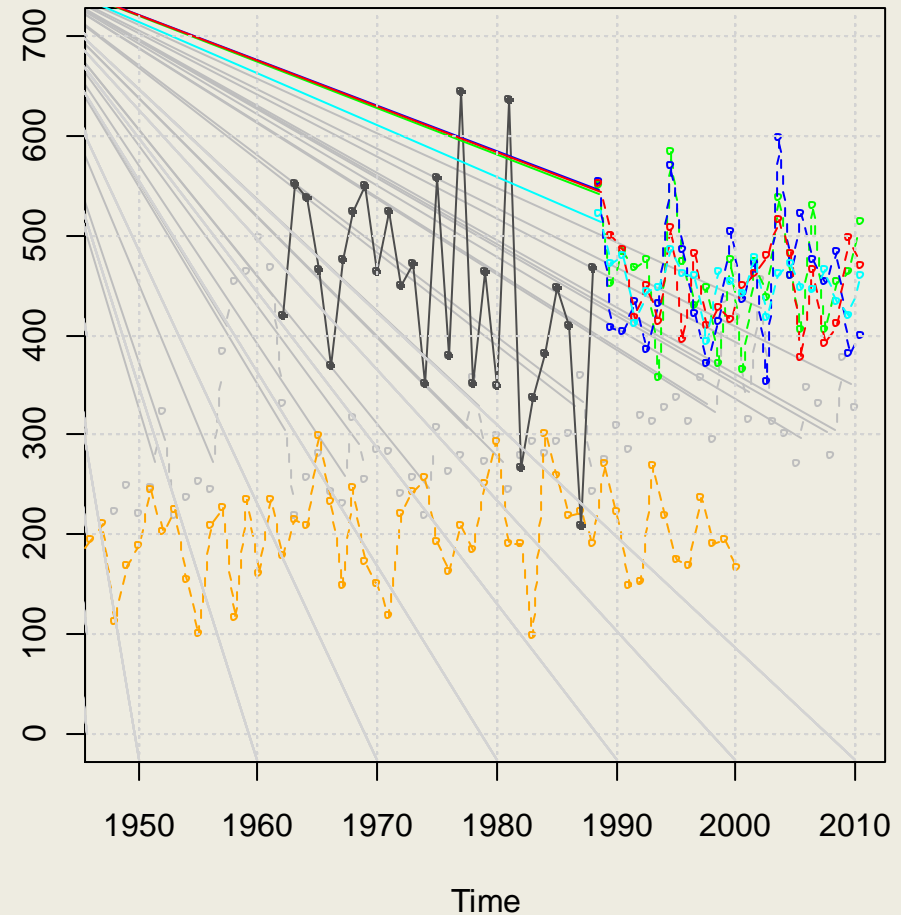
1. Dynamical Downscaling

- Physically-based predictions
- Can handle non-stationarity
- Requires extensive evaluation of RCM and GCM
- Computer and time intensive



2. Statistical Downscaling

- Data-based and not computer intensive
- Does not rely directly on GCM atmospheric dynamics
- Requires 30+ year meteorological station records
- Assumes stationarity



3. Physiographic Interpolation

- Physically based
- Highly localized at low computational expense
- Can utilize satellite data
- Derived from a larger scale projection
- Requires extensive station data for calibration and evaluation

Summary

- The utility of GCM projections depends on region and impact of interest
- Dynamical downscaling is valuable in regions where GCMs have credible large-scale dynamics, but is resource intensive (computers, people)
- Much can be achieved with statistical + topographic methods, but data and understanding are required
- Coordinated dynamical-statistical approaches are optimal, resources allowing